DOCUMENT RESUME

ED 180 799 **SE 029 500**

AUTHOR Schlenker, Richard M.: Dillon, Timothy
TITLE Basic Laboratory Equipment Procedures and Safety Precautions for General Chemistry Students.
PU DATE Jan 80
NOTE 49p.: For related document, see SE 029 459

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Chemistry: College Science: Higher Education: *Instructional Materials: *Laboratory Procedures: Laboratory Techniques: *Safety: Science Courses: Science Education: *Science Equipment: Science Instruction: Science Materials

ABSTRACT

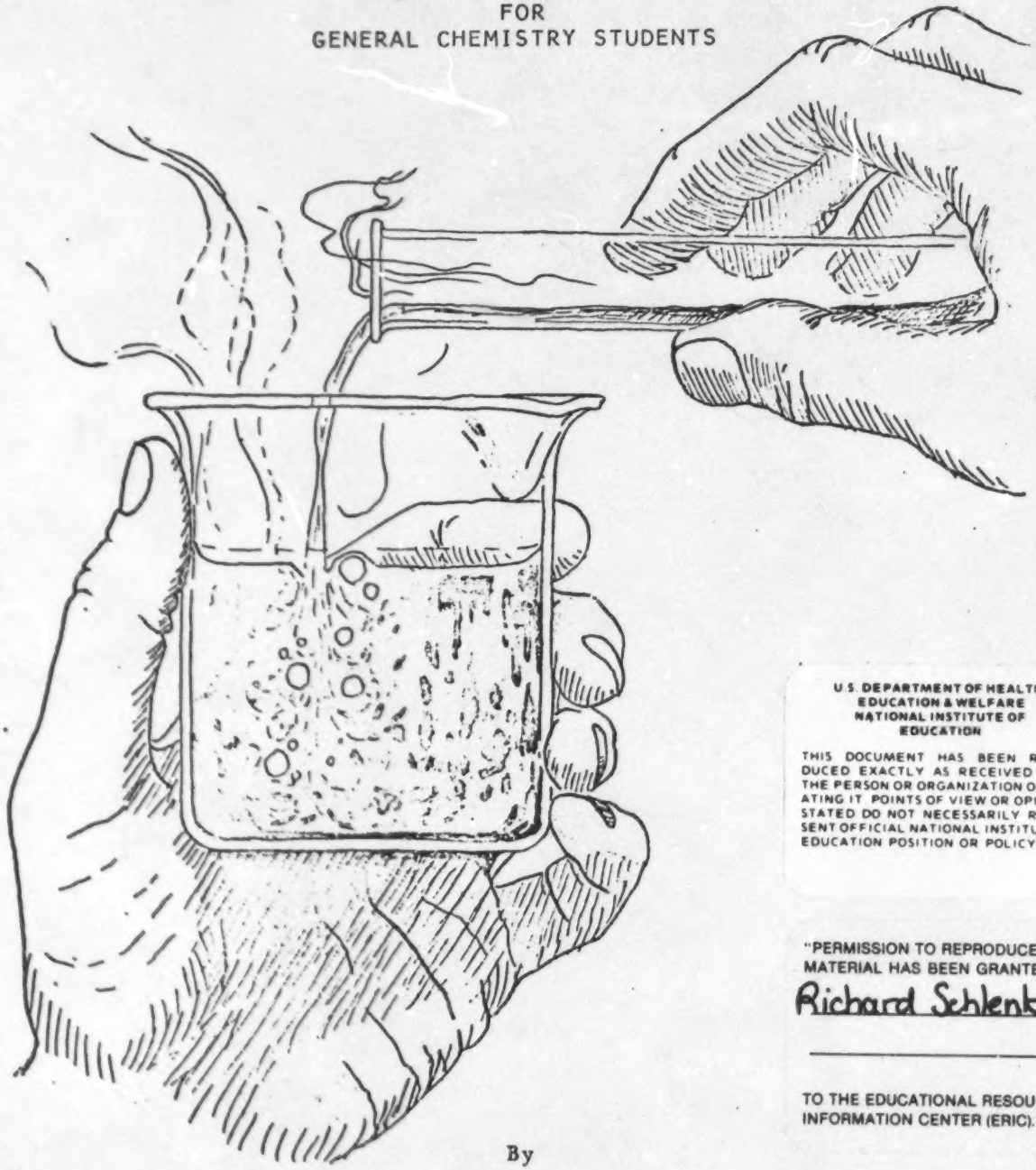
This laboratory guide for college chemistry students illustrates scientific equipment used in introductory chemistry courses. Common laboratory procedures are diagrammed with the intention of promoting the safe use of equipment. An index is included to facilitate finding the necessary information. (SA)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED180799

SE

BASIC LABORATORY EQUIPMENT PROCEDURES AND SAFETY PRECAUTIONS FOR GENERAL CHEMISTRY STUDENTS



U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Richard Schlenker

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

By

Richard M. Schlenker
and
Timothy Dillon
Maine Maritime Academy
Castine, Maine
January 1980

SE 029 500

INTRODUCTION

Basic Laboratory Procedures and Safety Precautions for General Chemistry Students was written specifically for beginning chemistry students. Further, it was intended to act as a supplement to general chemistry laboratory manuals. The text concerns itself with the following subjects: Laboratory Safety Procedures; Laboratory Procedures and Laboratory Glassware and Equipment.

LABORATORY GLASSWARE AND EQUIPMENT

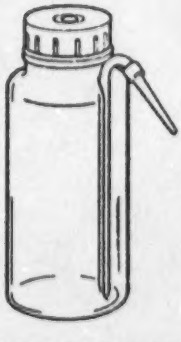
The specific types of equipment and the actual variety of glassware used in General Chemistry depends upon the type of institution in which the course is offered, the types of students involved in the course (majors and non-majors), the types of degree programs for which the course satisfies requirements (Education, Marine Engineering, Biology, etc.), and lastly the orientation of the chemistry instructor. In this regard, you may not actually use some of the equipment and glassware shown in the following pages.

BEAKER

ERLENMYER
FLASK

FLORENCE
FLASK

CRUCIBLE
AND COVER

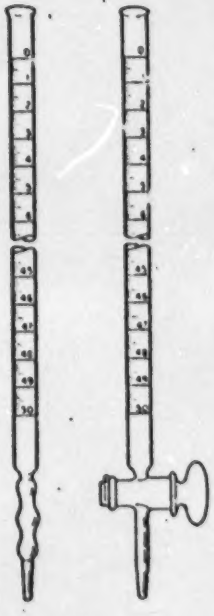


WASH BOTTLE

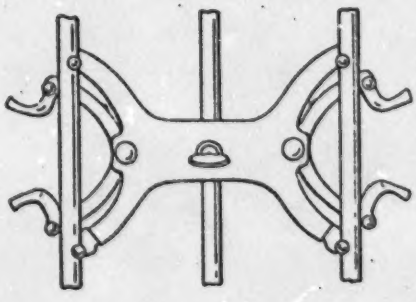
CRUCIBLE TONGS

GRADUATED
CYLINDER

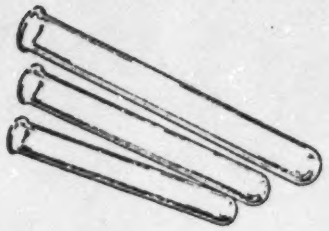
WIDE MOUTH
BOTTLE



BURETS



BURET CLAMP

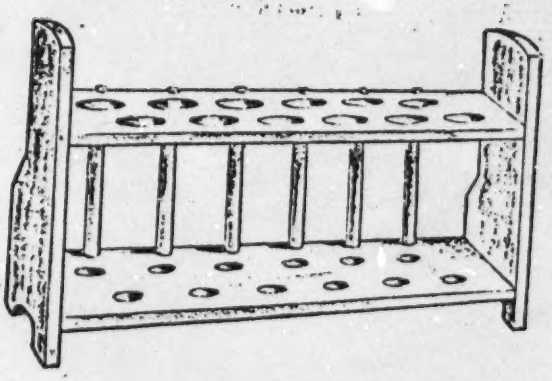


TEST TUBE

TEST TUBE
HOLDER

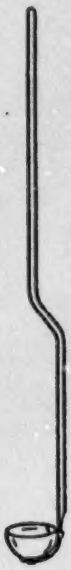
IGNITION TUBE

TEST TUBE BRUSH



TEST TUBE RACK

VOLMETRIC PIPET

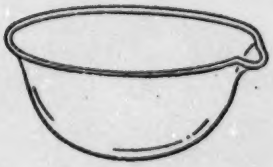


DEFLAGRATION SPOON

THERMOMETER

TRANSFER PIPET

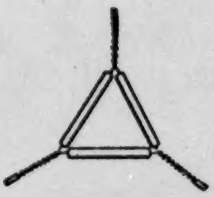
MEDICINE DROPPER



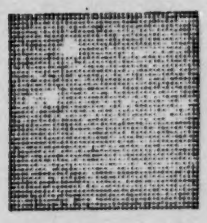
EVAPORATING DISH

WATCH GLASS

RING STAND



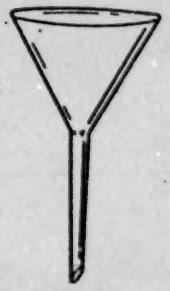
CLAY
TRIANGLE



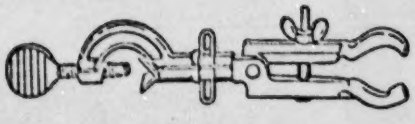
WIRE
GAUZE

RING SUPPORT

BUNSEN BURNER



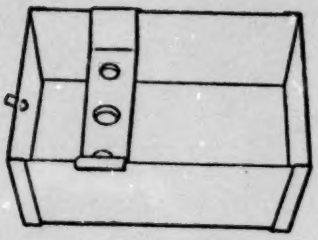
FUNNEL



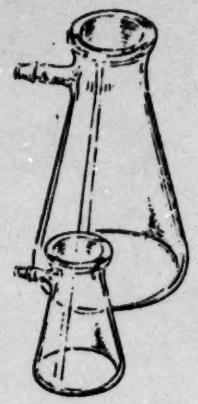
UTILITY CLAMP

WING TOP
FLAME SPREADER

THISTLE TOP



PNEUMATIC-TROUGH



FILTER FLASKS

BUCHNER FUNNEL

SEPARATORY FUNNEL

DRYING TUBES

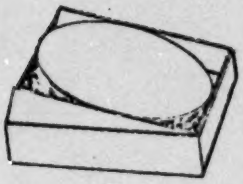
MORTAR AND PESTLE

DEEP BLUE
COBALT GLASS

THISTLE TUBE

NICHROME WIRE

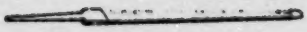
STIRRING ROD



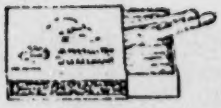
FILTER PAPER

RUBBER STOPPERS

CLAMP HOLDER



TRIANGULAR FILE



MATCHES

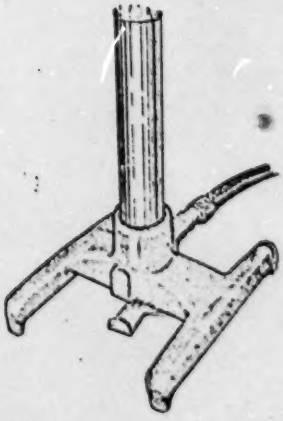
LITMUS PAPER

EXTENSION CLAMP

FLAME SPREADER

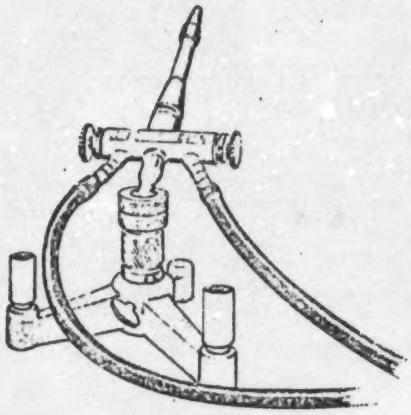
PINCHCOCK CLAMP

SCREW CLAMP

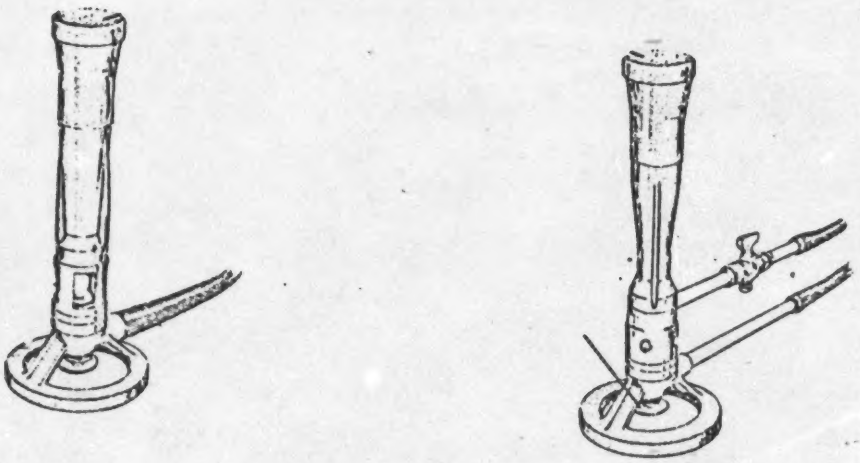


H-BASE BURNER

RUBBER TUBING

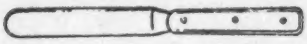


BLAST BURNER

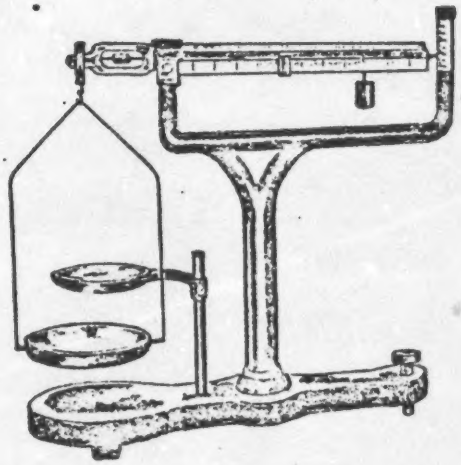


FISHER BURNERS

ASBESTOS SQUARE

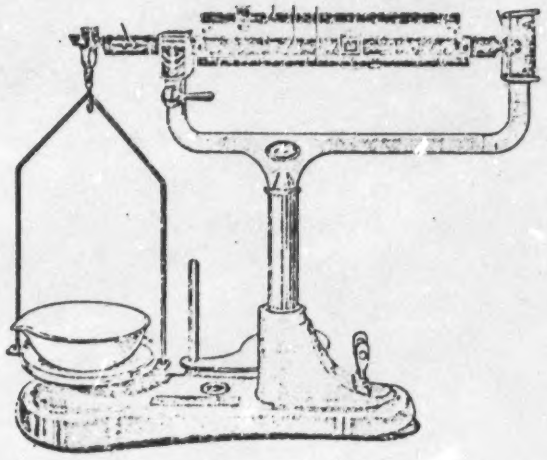


SPATULA

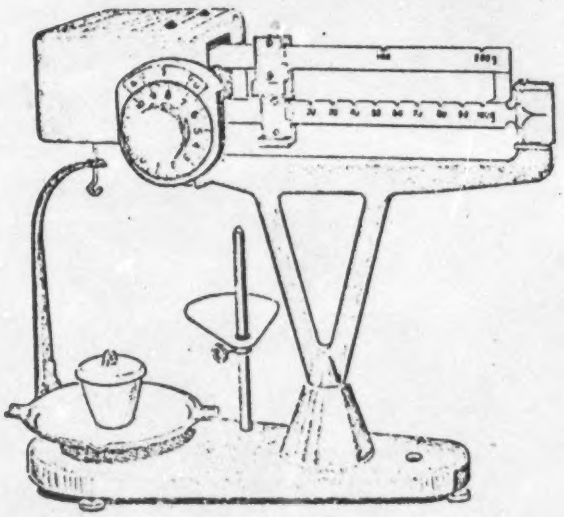


TRIPLE-BEAM BALANCE

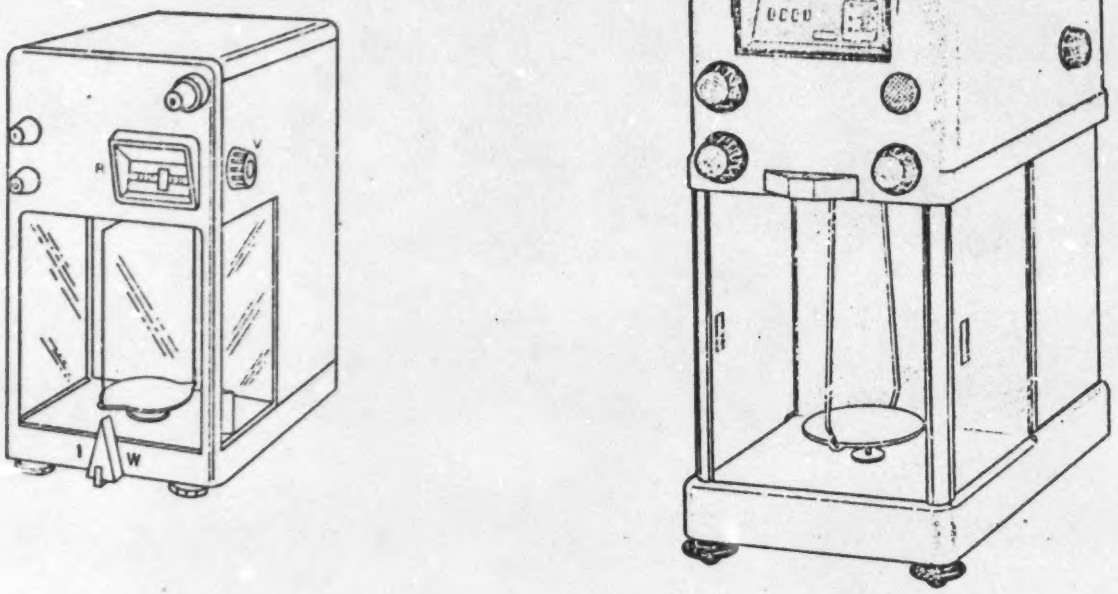
FORCEPS



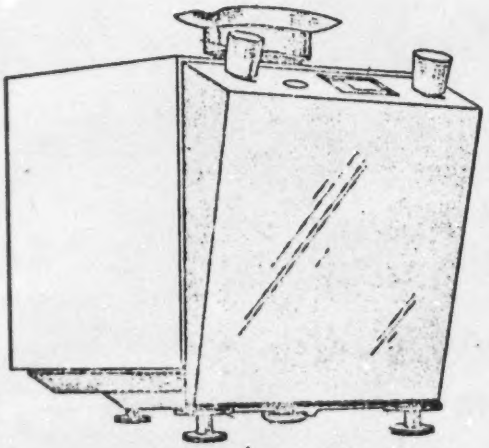
TRIPLE-BEAM BALANCE



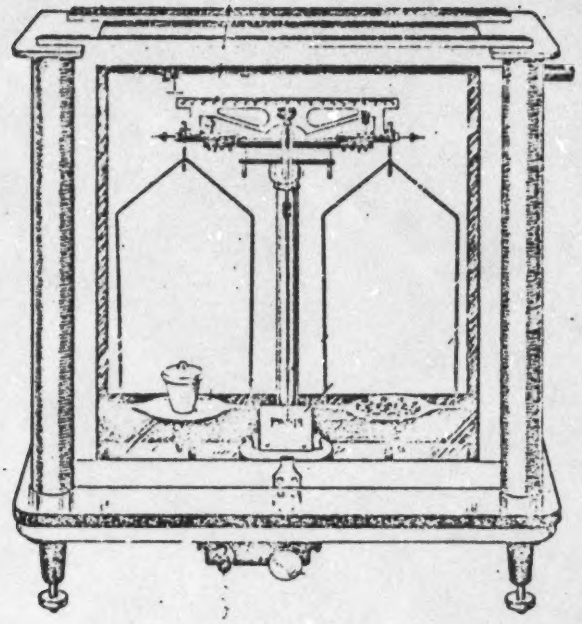
SEMIANALYTICAL BALANCE



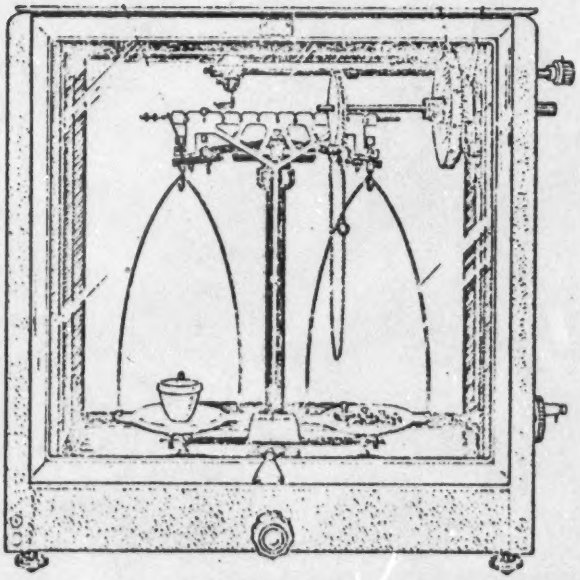
SINGLE PAN ANALYTICAL BALANCES



SEMIANALYTICAL TOP-LOADING
SINGLE-PAN BALANCE



DOUBLE-PAN EQUAL ARM ANALYTICAL BALANCE

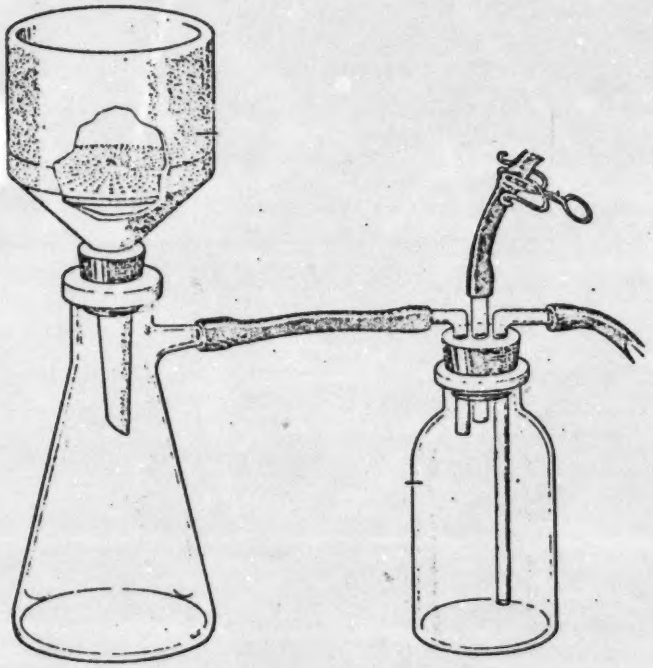


CHAIN TYPE DOUBLE-PAN EQUAL ARM ANALYTICAL BALANCE

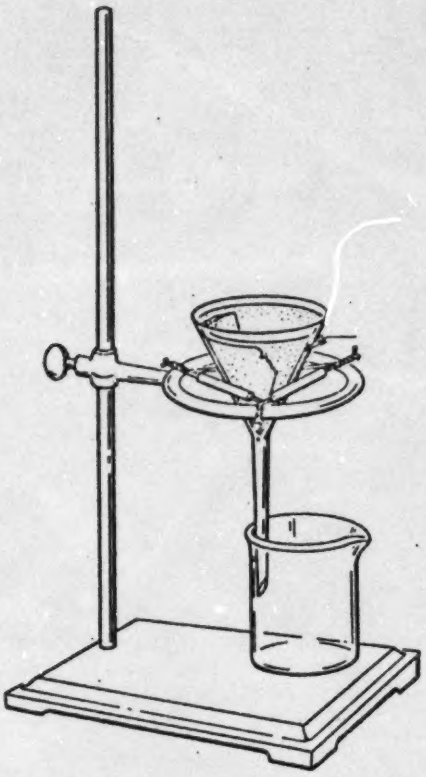
CENTRIFUGE

SAMPLE EQUIPMENT CONFIGURATIONS

Laboratory experiment instructions often leave the student in a quandry as to how various pieces of laboratory equipment should actually be fastened together. The diagrams which follow should remove some of the mystery from these setups.

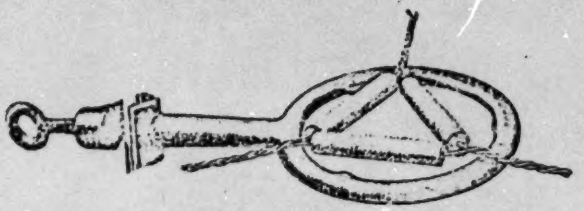


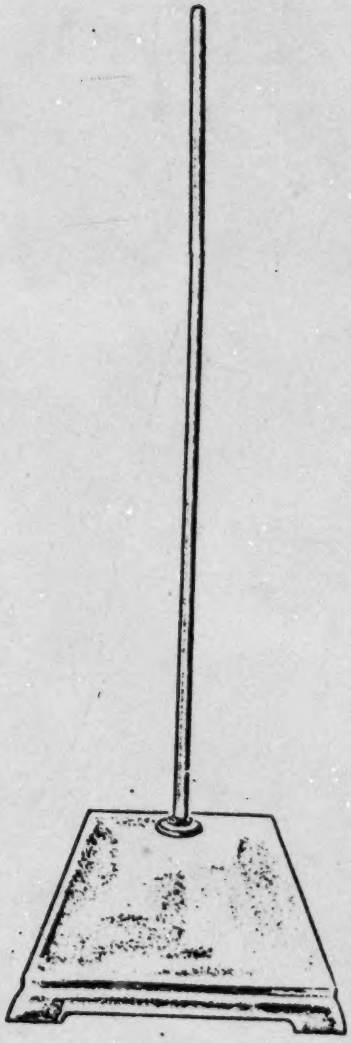
FILTRATION SET UP



FILTRATION SET UP

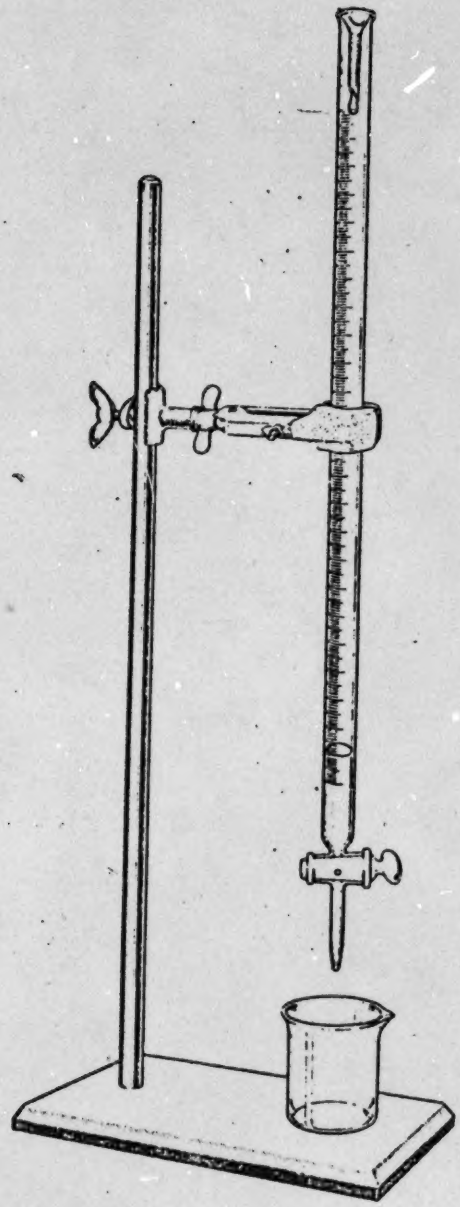
FILTRATION SET UP



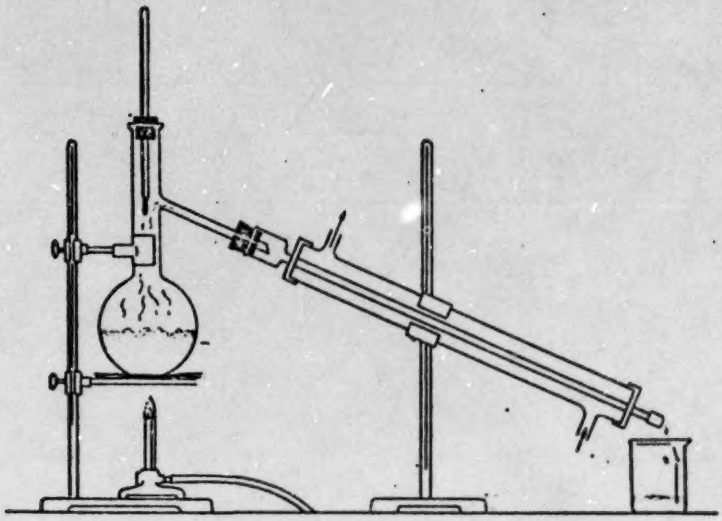


21

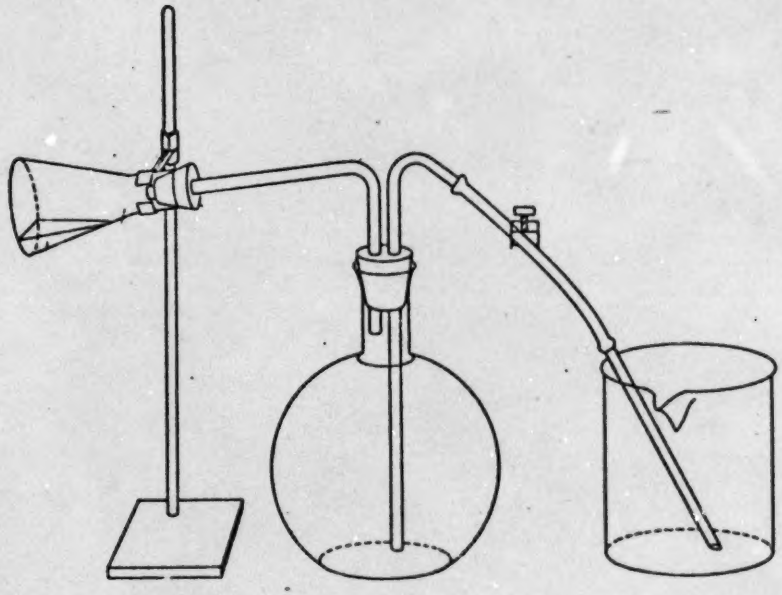
RING STAND AND ASSOCIATED ATTACHMENTS



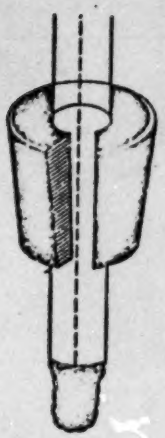
RING STAND SET UP



DISTILLATION EQUIPMENT SET UP



GAS COLLECTION SET UP



SPLIT STOPPER SET UP

BURNER SET UP

LABORATORY EQUIPMENT - USE AND TECHNIQUES

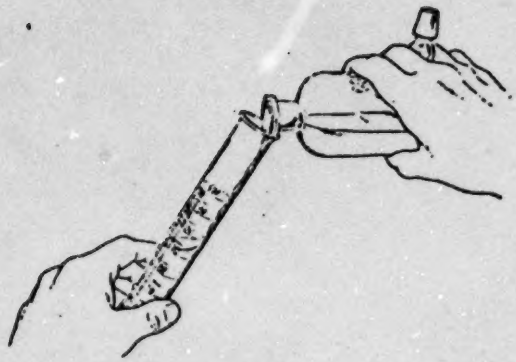
Here the student is provided with some basic techniques for using laboratory hardware and equipment.

READ LABELS CAREFULLY BEFORE USING CONTENTS

REMOVE TOPS PROPERLY

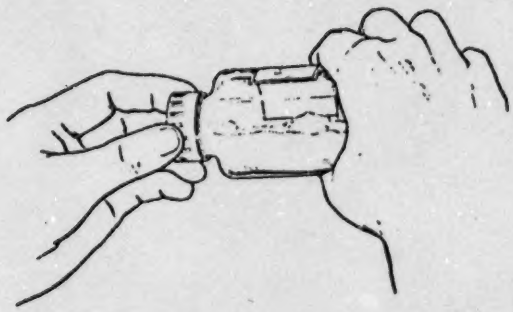
HOLD BOTTLES PROPERLY WHEN REMOVING TOPS

REMOVE TOPS PROPERLY

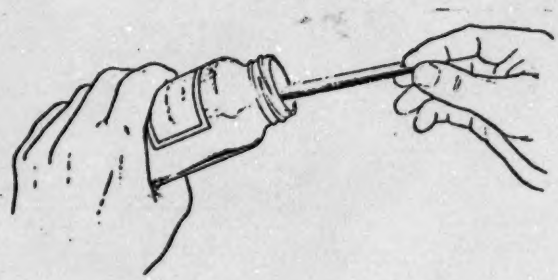


NEVER SET THE STOPPER DOWN

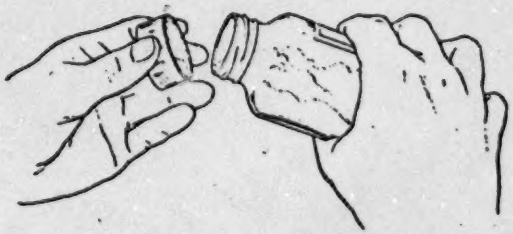
TAP CAP WITH A SOLID OBJECT



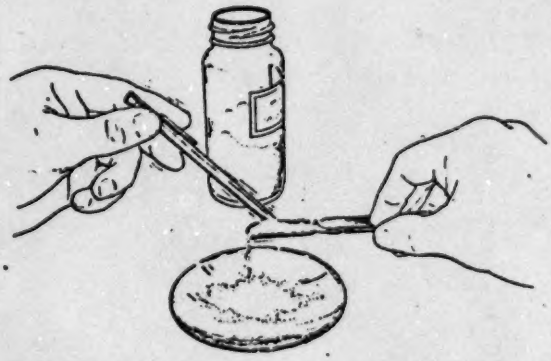
ROLL THE TOP UNTIL SOME CONTENTS ENTER THE TOP



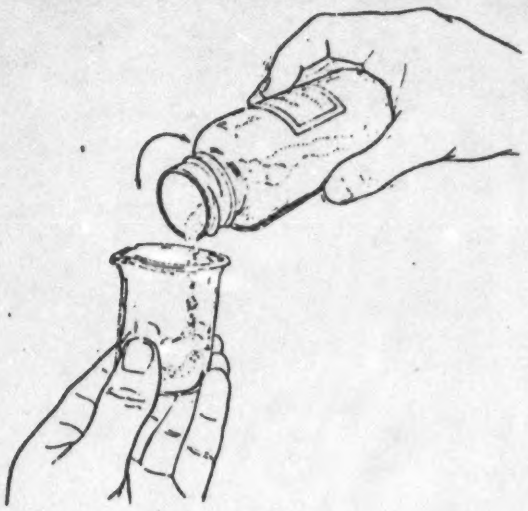
REMOVE CONTENTS WITH SPATULA



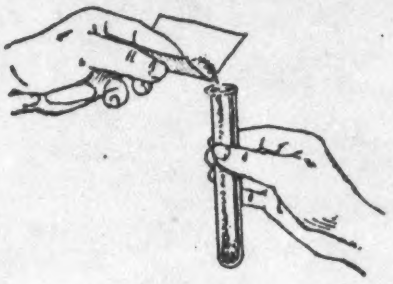
REMOVE TOP WHILE RETAINING SOME CONTENTS IN TOP



TAP SPATULA WITH A SOLID OBJECT

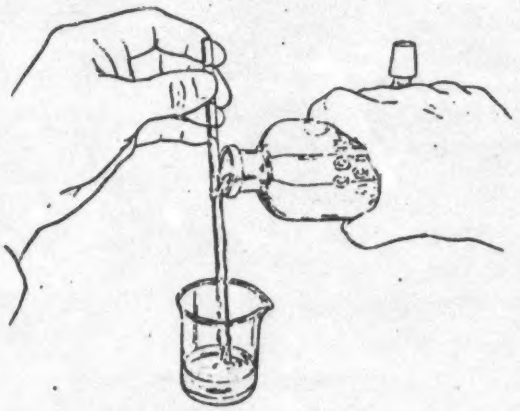


POUR CONTENTS FROM CONTAINER



FOLD ALONG PRECREASED AREA AND POUR

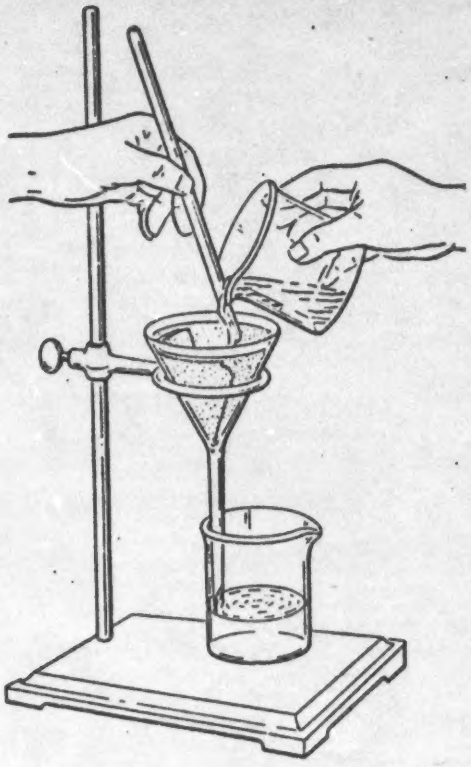
POUR WHILE SHAKING GENTLY



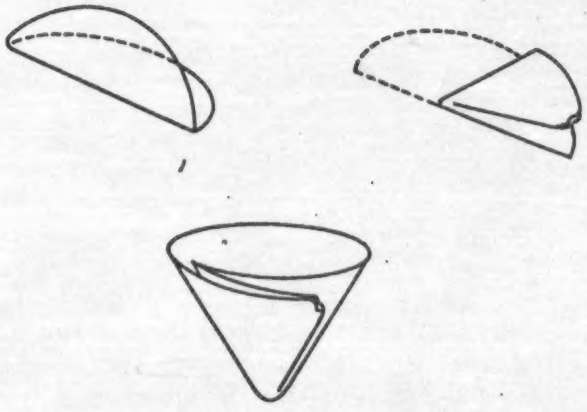
POURING DOWN A STIRRING ROD

POUR AND TAP GENTLY

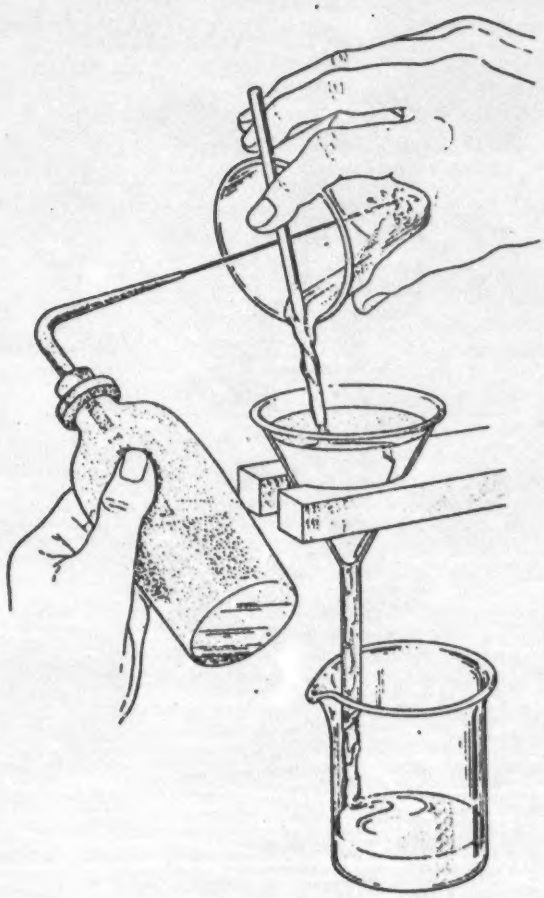
POURING DOWN A STIRRING ROD



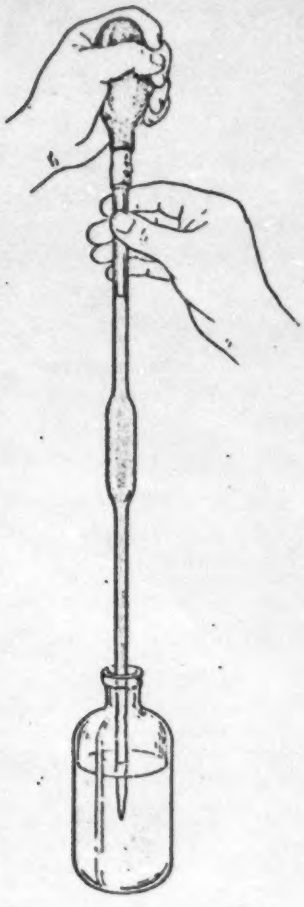
POURING DOWN A STIRRING ROD

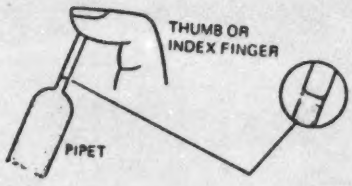


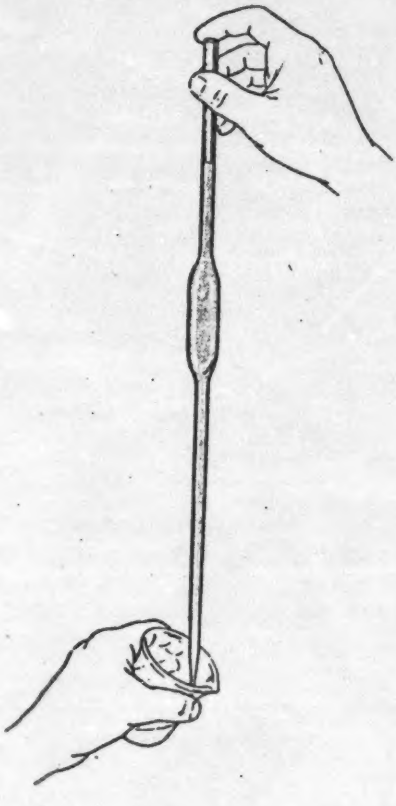
PROPER FOLDING OF FILTER PAPER

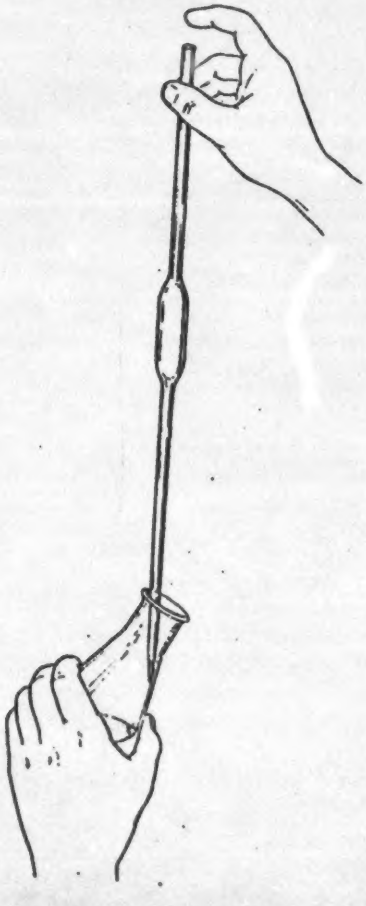


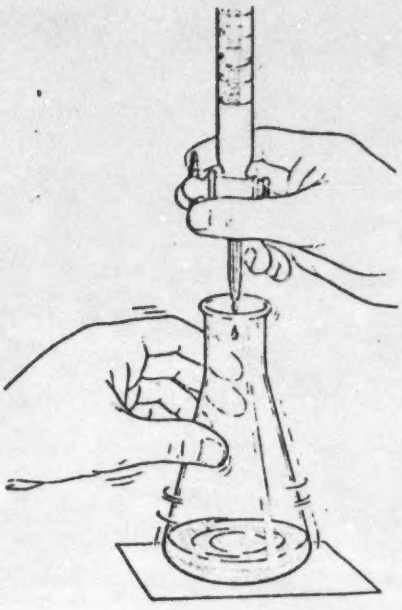
PROPER METHOD OF RINSING A CONTAINER

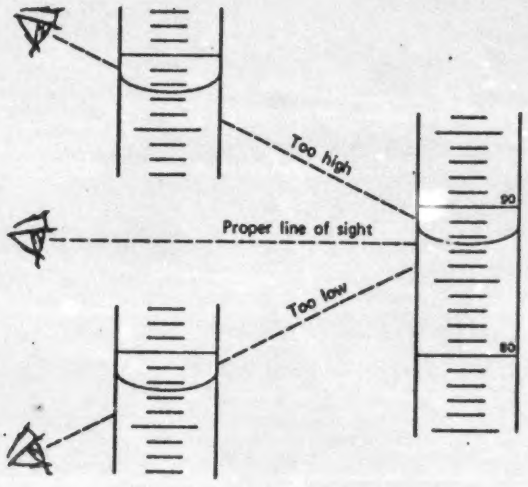


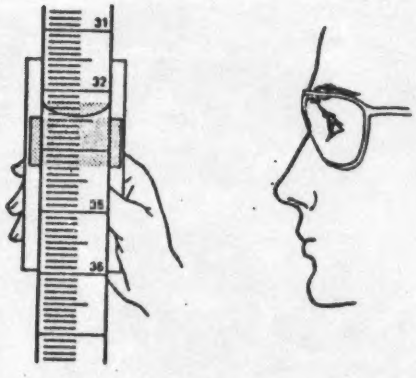

THUMB OR
INDEX FINGER
PIPET



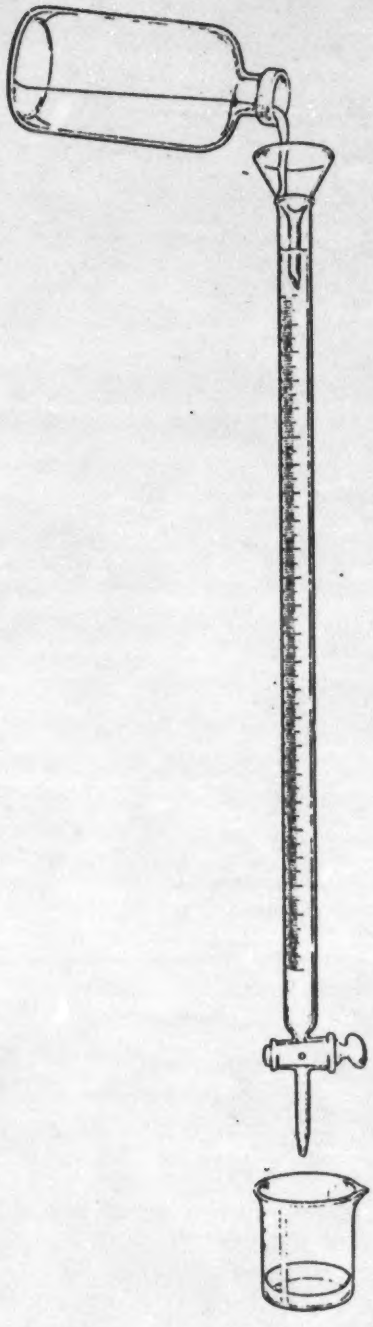


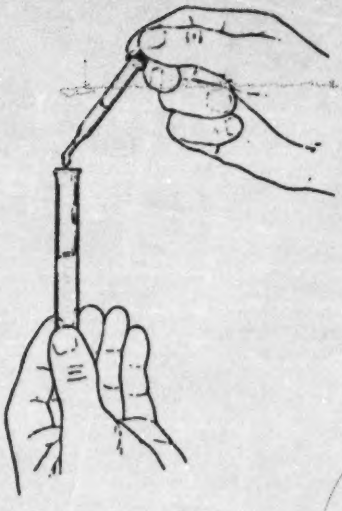






READING THE MENISCUS

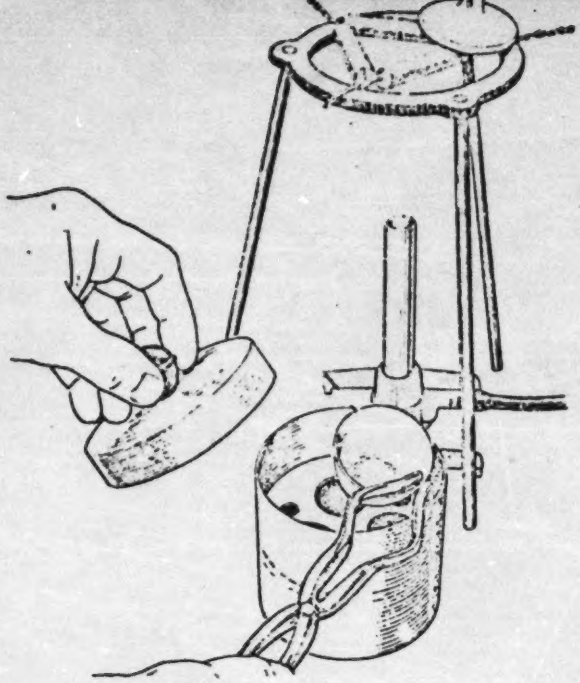




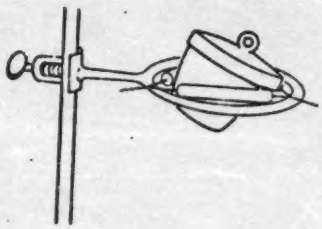
CORRECT METHOD OF TRANSFER FROM MEDICINE DROPPER TO TEST TUBE

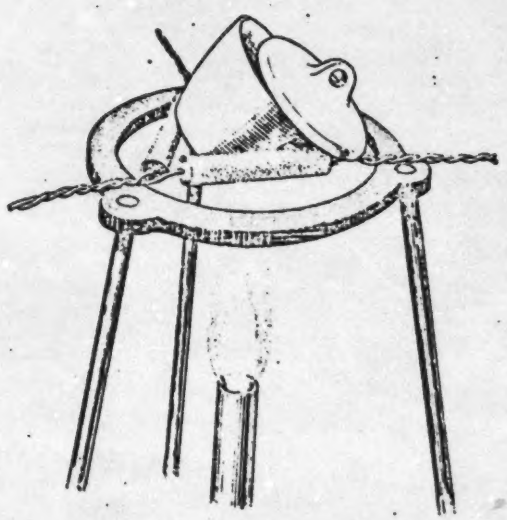
BUBBLE REMOVAL

ADHERING DROP REMOVAL

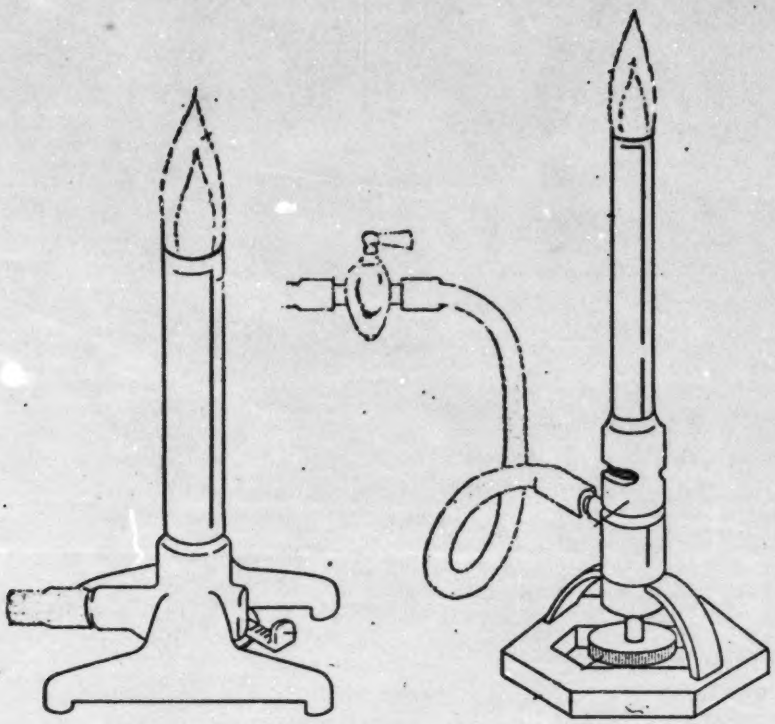


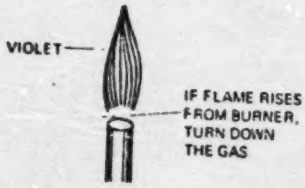
HANDLING A CRUCIBLE

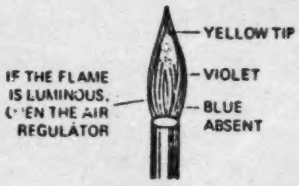


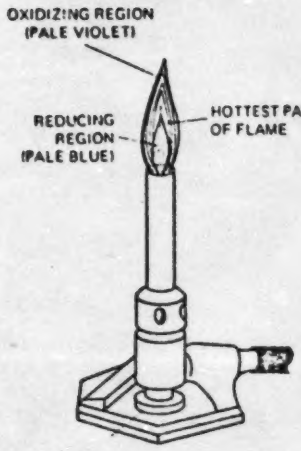


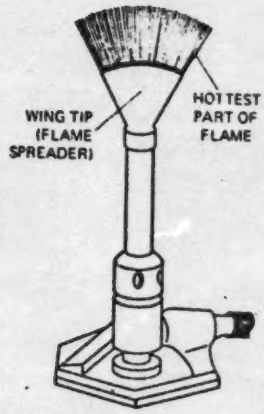
HEATING A CRUCIBLE





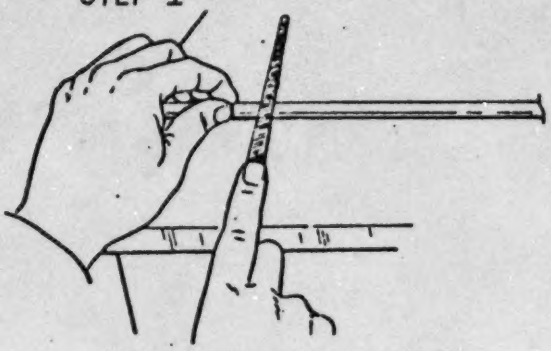






PROPER ADJUSTMENT

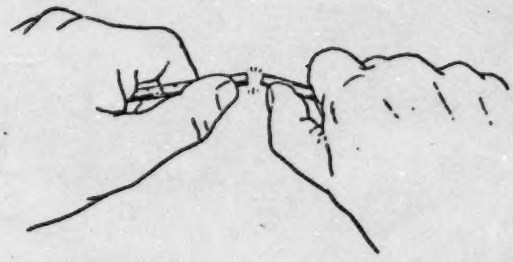
STEP 1



SCRATCHING TUBING WITH A FILE WHERE BREAK IS TO BE MADE

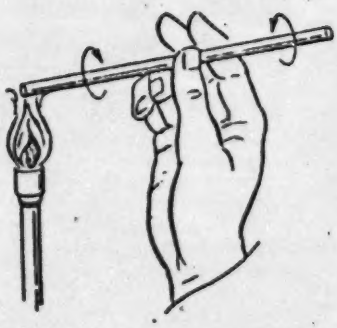
STEP 2

STEP 3



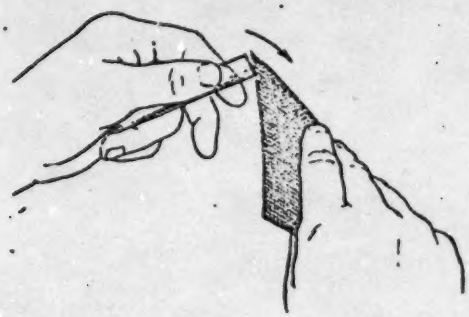
GLASS TUBE BREAKING TECHNIQUE

STEP 5



POLISH THE JAGGED END OVER A FLAME

STEP 4

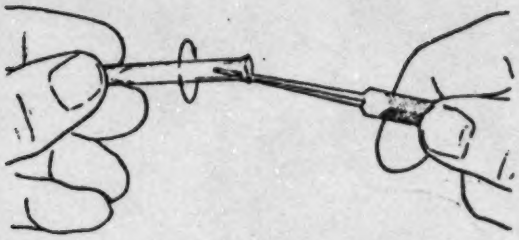


STROKE THE JAGGED END OF THE TUBE WITH A WIRE SCREEN

STEP 7

RESULT OF PROPER
FIRE POLISHING

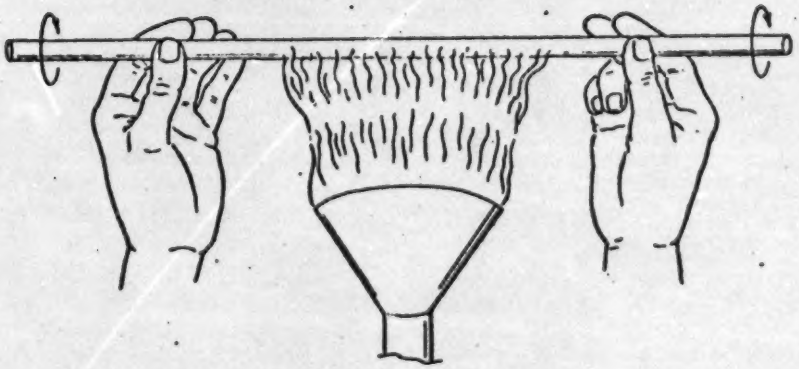
STEP 8



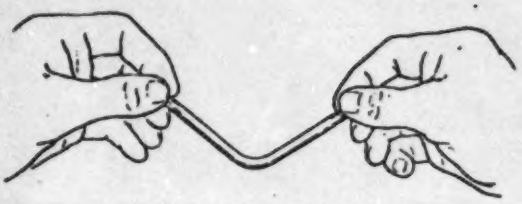
FLARE PROCEDURE FOR CUT TUBING
(HEAT THE END OF THE TUBE FIRST)

GLASS TUBE BENDING
AND
DRAWING TECHNIQUES

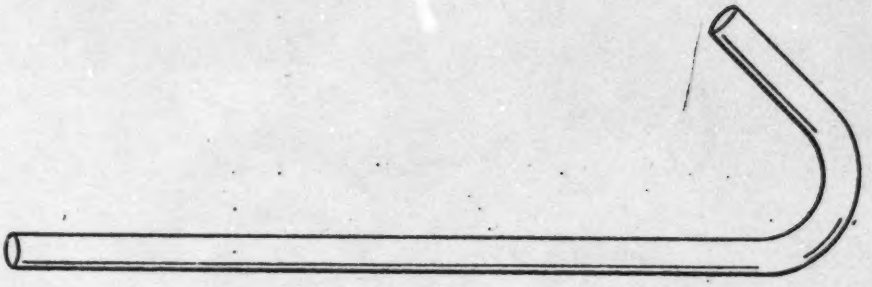
BENDING - STEP 1



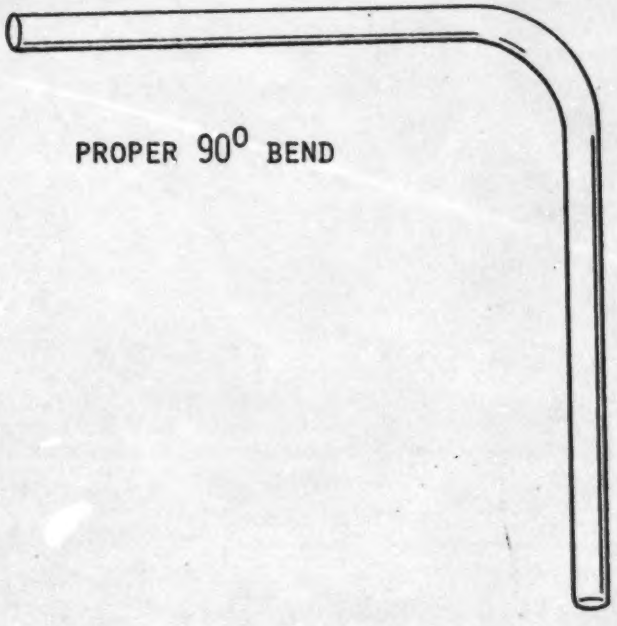
· STEP 2



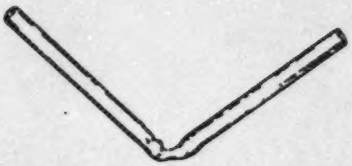
BEND QUICKLY TO
DESIRED ANGLE



PROPER 135° BEND



PROPER 90° BEND



POOR BEND (HEATED TOO STRONGLY AT ONE POINT)

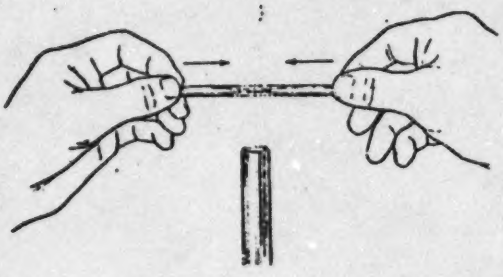
POOR BEND (NOT HEATED IN THE CENTER)

DRAWING

STEP 1

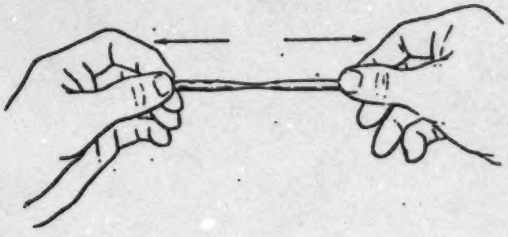
REPEAT STEP 1 FOR BENDING.

STEP 2



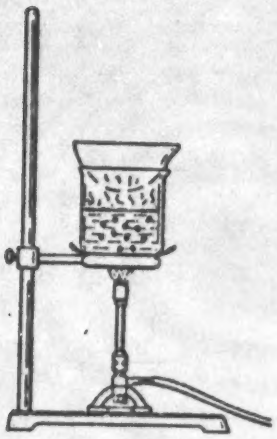
DRAW WITH EQUAL FORCE IN BOTH DIRECTIONS, ALLOWING THE TUBE DIAMETER TO DECREASE AS THE WALLS THICKEN TO ABOUT TWICE THEIR ORIGINAL THICKNESS.

STEP 3



STEP 4

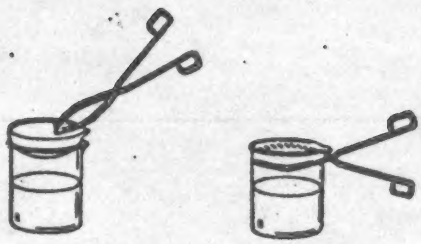
CUT TO DESIRED LENGTH



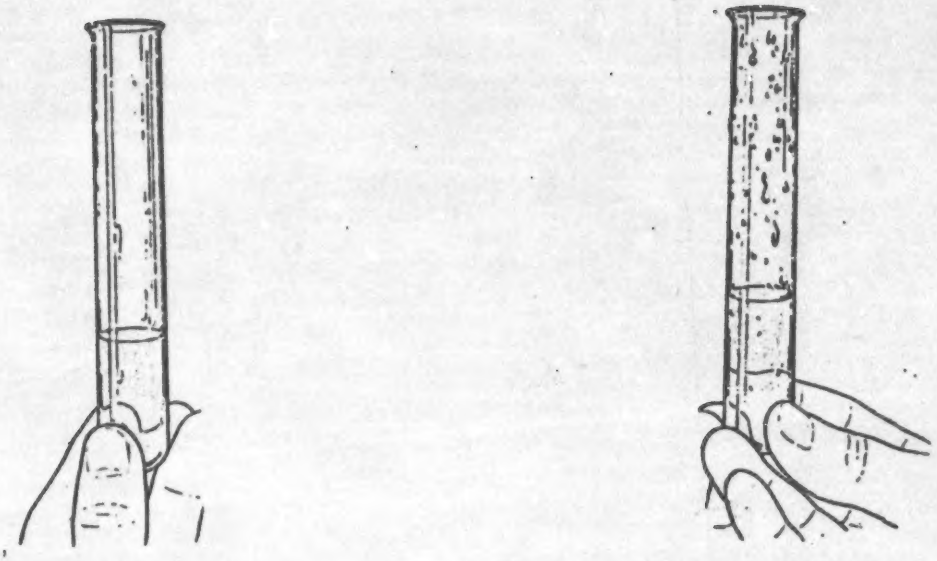
EVAPORATING PROCEDURE

RECRYSTALLIZATION PROCEDURE

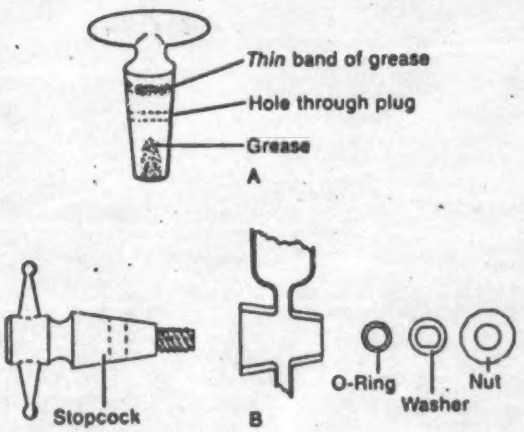
PROCEDURE FOR DRAWING OF ONE OF TWO UNMIXABLE ELEMENTS



PROPER USAGE OF TONGS



PROPER METHOD OF ASCERTAINING THE CLEANLINESS OF GLASSWARE

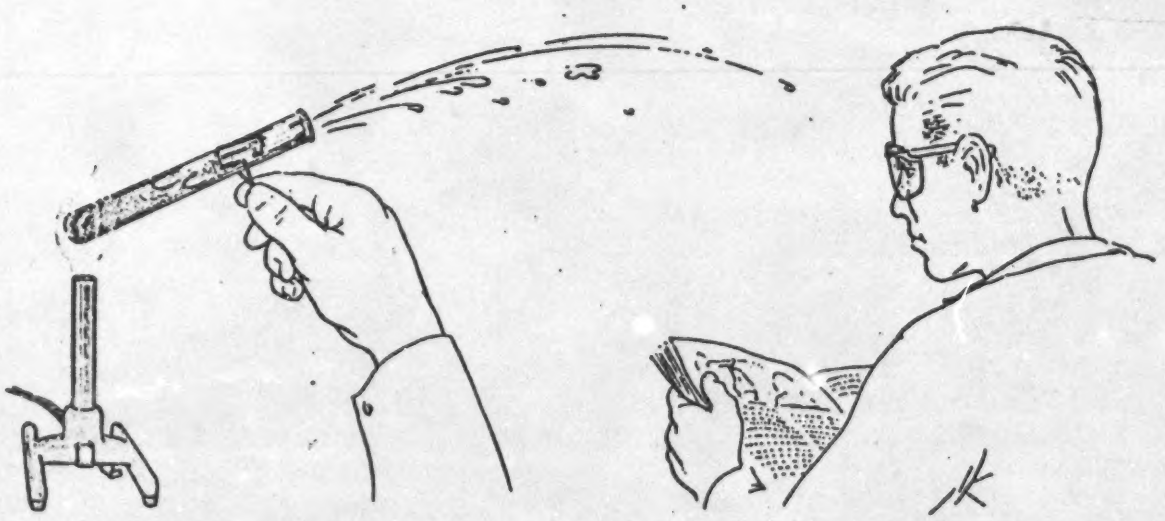


PROPER STOPCOCK LUBRICATION AND ASSEMBLY

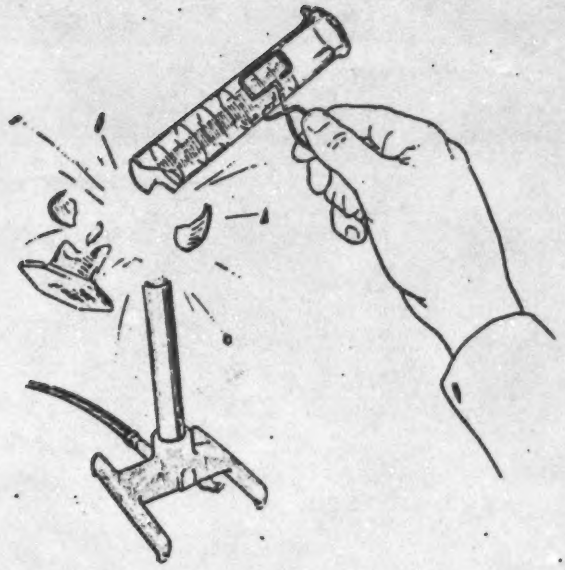
LABORATORY SAFETY PROCEDURES

Personal safety must be the concern of all who work in chemistry laboratories. While there is never assurance that laboratory accidents will not happen, their occurence may be minimized by following proper laboratory procedures and using correct equipment set ups. In addition, there are certain other practices which must be followed at all times. Some of those practices are shown in the following drawings.

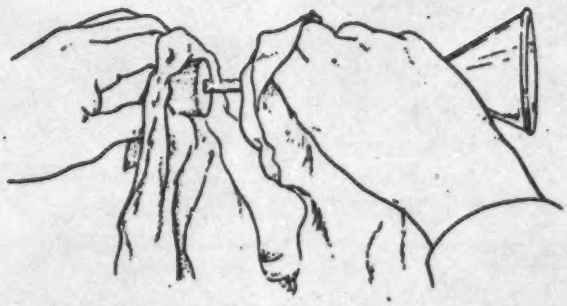
PROPER METHOD OF SMELLING UNKNOWN VAPORS



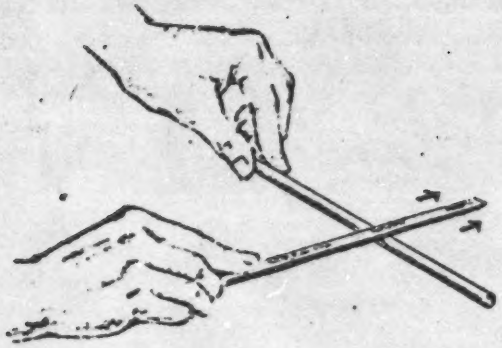
ALWAYS WEAR SAFETY GLASSES

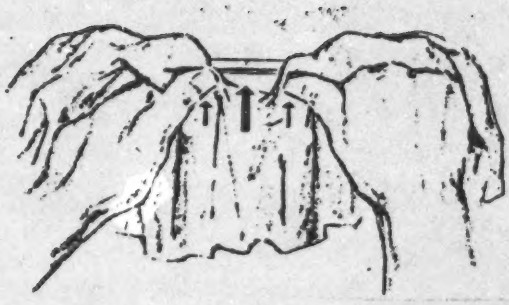


APPLY HEAT ONLY TO THE PROPER TYPES OF EQUIPMENT

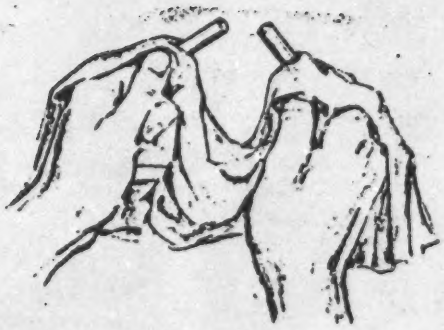


CORRECT METHOD OF INSERTING A GLASS TUBE INTO A STOPPER





PROPER METHOD OF HOLDING
GLASS TUBING
WHEN IT IS TO BE BROKEN



INDEX

		Page
A		
	ABESTOS SQUARE	12
B		
	BALANCE, CHAIN-TYPE, DOUBLE-PAN EQUAL ARM ANALYTICAL	15
	BALANCE, DOUBLE-PAN, EQUAL-ARM ANALYTICAL	15
	BALANCE, SEMIANALYTICAL	13
	BALANCE, SEMIANALYTICAL, TOP-LOADING SINGLE PAN	14
	BALANCE, SINGLE PAN	14
	BALANCE, TRIPLE BEAM	12
	BEAKER	2
	BOTTLE WASHER	2
	BREAKING GLASS TUBING, PROPER METHOD OF	33
	BRUSH, TEST TUBE	4
	BURET CLAMP	3
	BURETS	3
	BURET USE	
	BURNER ADJUSTMENTS	
	BURNER, BLAST	11
	BURNER, BUNSEN	6
	BURNER, FISHER	11
	BURNER, H-BASE	10
C		
	CENTRIFUGE	16
	CHEMICAL POURING FROM BOTTLES	22
	CLAMP, EXTENSION	10
	CLAMP HOLDER	9
	CLAMP, PINCHCOCK	10
	CLAMP, SCREW	10
	CLAMP, UTILITY	6
	COBALT GLASS, DEEP BLUE	8
	CRUCIBLE, HANDLING OF	31
	CRUCIBLE USE	31
D		
	DISH, EVAPORATING	5
E		
	EVAPORATING PROCEDURE	38
F		
	FILE	9
	FILTER PAPER FOLDING	9
	FLAME SPREADER, WING TOP	6
	FLASK, ERLENMYER	
	FLASK FILLER	
	FLASK, FLORENCE	2
	FORCEPS	12
	FUNNEL, BUCHNER	7
	FUNNEL, SEPARATION	7
G		
	GAUZE, WIRE	6

INDEX

		Page
G		
	GLASS TUBE BENDING, PROPER METHOD OF	34
	GLASS TUBE BREAKING, PROPER METHOD OF	33
	GLASS TUBE DRAWING, PROPER METHOD OF	34
	GLASSWARE CLEANLINESS	
H		
	HEATING GLASSWARE	
	HOLDER, TEST TUBE	
I		
	INSERTING GLASS TUBING IN STOPPERS	
L		
	LIQUID POURING FROM BEAKERS	24
	LIQUID POURING FROM BOTTLES	
	LIQUID TRANSFER, USING PIPETS	
M		
	MATCHES	9
	MEDICINE DROPPER	5
	MEDICINE DROPPER USE	
	MENISCUS READING	28
	MORTAR AND PESTLE	8
N		
	NUCHROME WIRE	
P		
	PAPER, FILTER	
	PAPER, LITMUS	
	PIPET. TRANSFER	
	PIPET, VOLUMETRIC	
	POURING CHEMICALS FROM BOTTLES	
R		
	RACK, TEST TUBE	4
	RECRYSTALLIZATION PROCEDURE	
	RING STAND ATTACHMENTS	
	ROD, STIRRING	
S		
	SEPARATING UNMIXABLE SOLVENTS PROCEDURE	
	SETUP, DISTILLATION EQUIPMENT	20
	SETUP, FILTRATION	17
	SETUP, GAS COLLECTION	20
	SETUP, H-BURNER	
	SETUP, RING STAND	
	SETUP, SPLIT STOPPER	
	SPATULA	12
	SPATULA USE	
	SPOON, DEFLAGRATION	
	SPREADER, FLAME	6
	SMELLING UNKNOWN VAPORS	41
	STAND, RING	6

S

	Page
STOPCOCK LUBRICATION AND ASSEMBLY	
STOPPERS, RUBBER	9
SUPPORT, RING	6

T

THERMOMETER	5
TONGS, CRUCIBLE	2
TONGS, PROPER USAGE OF	
TOP, THISTLE	6
TRIANGLE, CLAY	6
TROUGH, PNEUMATIC	7
TUBE, DRYING	7
TUBE, IGNITION	4
TUBE, TEST	4
TUBE, THISTLE	8
TUBING, RUBBER	10

W

WATCH GLASS	5
WATER BOTTLES, USE OF	
WEARING SAFETY GLASSES, REASON FOR	
WIDE MOUTH BOTTLE	3